

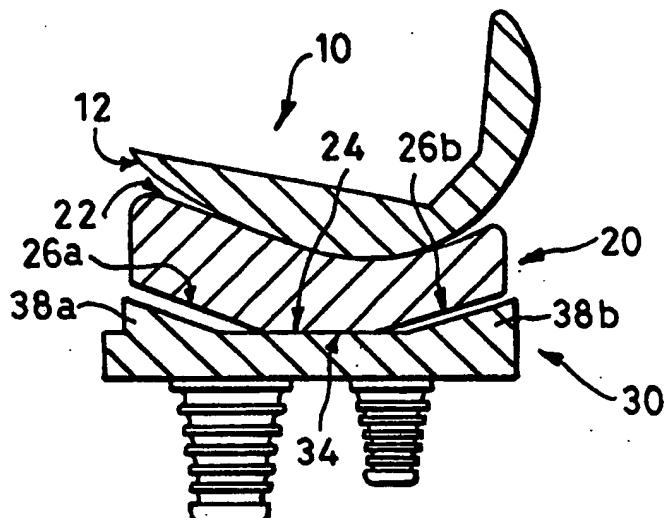
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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## (54) Title: UNICCOMPARTMENTAL KNEE PROSTHESIS

## (57) Abstract

A unicompartmental knee prosthesis comprises a femoral component (10), a meniscal component (20) and a tibial component (30). Interengaging means (26a, 26b, 38a, 38b) are provided between the meniscal and tibial components (20, 30) such that anterior-posterior, medial-lateral and rotational movement of the meniscal component (20) with respect to the tibial component (30) is allowed. The interengaging means comprise anterior and posterior inclined tongues (38a, 38b) and anterior and posterior inclined recesses (26a, 26b).



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Unicompartmental Knee Prostheses

The invention relates to a knee prosthesis, particularly to a unicompartmental knee prosthesis.

Unicompartmental knee prostheses, which allow replacement of only one side of a knee joint, are known. This type of prosthesis is used when one side of a knee joint is damaged or diseased but the other side is sufficiently healthy to continue to function normally. Unicompartmental replacement of one side or the other of the knee joint avoids unnecessary removal of healthy bone and other tissue, reduces the recovery time of the patient and gives a higher probability of restoration of full function of the knee joint.

However, most known unicompartmental knee prostheses consist effectively of two components, the tibial component and the femoral component, although the tibial component may be formed from a metal base and a high-strength, low-friction plastics upper surface fixedly connected to the base. This means that the tibial component must be accurately located with respect to the femoral component, otherwise the knee joint will not manipulate smoothly. Providing accurate location of the tibial component significantly increases the length of the operative procedure because careful and extensive

manipulative tests must be carried out before final location of the respective parts can be achieved.

British patent no. 1534263 describes a unicompartmental three-part knee prosthesis which has a meniscal component located between the tibial and femoral components and which glides on the superior surface of the tibial component so as to accommodate small amounts of misalignment created during surgery. Two alternative versions are disclosed; an unrestricted arrangement and an arrangement wherein the movement of the meniscal component relative to the tibial component is restricted by means of an interengaging tongue and recess and, if rotation is to be restricted as well, by the provision of an upstanding wall located on the tibial component. Unrestricted arrangements have been found to be unsatisfactory for some patients because the meniscal component can become disengaged from the tibial component. The proposed restricted arrangement involves the provision of an undercut projection and recess and also an appropriately shaped wall, all of which is expensive to manufacture.

It is an object of the present invention to provide a unicompartmental three-part knee prosthesis which allows restricted relative movement between the meniscal and tibial components and which is easier and cheaper to manufacture than the prior art.

The invention provides a unicompartmental knee

prosthesis as claimed in claim 1. Advantageous features are set out in the subsidiary claims.

The prosthesis according to the invention allows the meniscal component to self-centre itself to provide the best possible configuration of the overall assembly. However, medial-lateral, anterior-posterior and rotational movement are all limited so as to provide adequate stability of the knee joint for the recipient of the prosthesis. Furthermore, the features needed to provide this stability are easy and therefore inexpensive to provide in the meniscal and tibial components which result in provision of an improved product.

Embodiments of the invention will now be described with reference to the accompanying drawings, wherein:

Figure 1 is a side view of a femoral component forming part of a unicompartmental knee prosthesis according to the present invention;

Figure 2a is a plan view of a meniscal component forming part of a unicompartmental knee prosthesis according to the invention;

Figure 2b is a sectional view taken along the line II-II shown in Figure 2a;

Figure 3a is a plan view of a tibial component forming part of a unicompartmental knee prosthesis according to the invention;

Figure 3b is a sectional view taken along the line

III-III shown in Figure 3a;

Figure 4 is a sectional side view of a first embodiment of a unicompartmental knee prosthesis according to the invention consisting of the components illustrated in Figures 1 to 3b; and

Figure 5 is a sectional side view of an alternative embodiment of a unicompartmental knee prosthesis according to the invention.

Figures 1 to 3b show the individual components of a unicompartmental knee prosthesis according to the invention. The femoral component 10 of the knee prosthesis assembly is shown in Figure 1 and consists essentially of a unicondylar surface 12. The femoral component 10 is of standard shape and also includes some form of fixing component (not shown), preferably consisting of appropriate pegs or stems. By means of the fixing component (not shown), the femoral component 10 can be affixed to the prepared femur of the recipient of the prosthesis assembly. The fixing component (not shown) forms no part of the present invention and will not be described in further detail.

The meniscal component 20 of the present invention is shown in Figures 2a and 2b. As can be seen from Figure 2a, the meniscal component 20 is generally D-shaped in plan view. The meniscal component 20 has an upper condylar surface 22 which is shaped to interact with and support the condylar surface 12 of the femoral

component 10. The shape of the upper surface 22 of the meniscal component 20 is well known and will not be further described. The meniscal component 20 also incorporates a planar lower surface 24 in which are located anterior and posterior tapered recesses 26a, 26b. The recesses 26, 26b increase in depth towards the edge of the meniscal component 20. Furthermore, each recess 26a, 26b is substantially wedge-shaped in plan view as can be seen from Figure 2a. For ease of manufacture, the ends 28a, 28b of the recesses 26a, 26b are preferably straight and arranged parallel to one another. However, if desired, the ends 28a, 28b could be arranged so as to be arcuate.

The tibial component 30 of the prosthesis assembly is shown in Figures 3a and 3b. The tibial component 30 is similar in shape to the meniscal component 20 when viewed from above. Essentially, the tibial component 30 consists of a plateau 32 having a planar upper surface 34 across which the lower surface 24 of the meniscal component 20 is intended to glide. The tibial component 30 also incorporates fixing elements 36 which can take the form of pegs as shown or stems. The fixing elements 36 can be varied according to requirements and form no part of the present invention.

The plateau 32 incorporates anterior and posterior ramps 38a, 38b. The ramps 38a, 38b increase in height towards the edge of the tibial component 30 although the

maximum height of each ramp 38a, 38b does not exceed the maximum depth of the recesses 26a, 26b formed in the meniscal component 20. The sides of the ramps 38a, 38b are preferably parallel to one another although a certain amount of divergence is possible.

The relative dimensions of the ramps 38a, 38b and the recesses 26a, 26b are such that, when the meniscal component 20 is carried by the tibial component 30, the ramps 38a, 38b extend into the recesses 26a, 26b. However, because the spacing between the ramps 38a, 38b is greater than the spacing between the recesses 26a, 26b, anterior and posterior movement of the meniscal component 20 with respect to the tibial component 30 is allowed. Furthermore, because the width of the ramps 38a, 38b is less than the minimum width of the recesses 26a, 26b, medial and lateral movement is also permitted. Moreover, the fact that the recesses 26a, 26b are substantially wedge-shaped whereas the ramps 38a, 38b are substantially elongate means that a certain amount of rotation of the meniscal component 20 with respect to the tibial component 30 can also be achieved.

The femoral and tibial components 10, 30 are formed from metal, preferably a cobalt-chrome alloy. The condylar surface 12 of the femoral component and the upper surface 34 of the tibial component 30, including the upper surfaces of the ramps 38a, 38b, are highly polished to give a smooth finish. The fixing components

of the femoral and tibial components 10, 30 and/or the other surfaces which are designed to come into contact with bone may be provided with a textured finish designed to encourage bone ingrowth. These surfaces may also be coated with an appropriate coating such as Hydroxyapatite.

The meniscal component 20 is preferably formed from a low density plastics material. A suitable material is ultra-high molecular weight polyethylene.

The three individual components illustrated in Figures 1 to 3b are shown in assembled form in Figure 4. In the assembled form, the femoral component 10 is supported by the meniscal component 20 which, in turn, rests on the tibial component 30. The interaction of the condylar surface 12 of the femoral component 10 and the upper surface 22 of the meniscal component 20 is the same as that in other unicompartmental knee prostheses. It is the interaction of the meniscal component 20 and the tibial component 30 which is different in the case of this assembly. As can be seen from Figure 4, the lower surface 24 of the meniscal component rests on the upper surface 34 of the tibial component 30 and the ramps 38a, 38b project into the recesses 26a, 26b. When the forces acting on the overall assembly cause the meniscal component 20 to move with respect to the tibial component 30, the lower surface 24 of the meniscal component 20 glides across the upper surface 34 of the

tibial component 30 within the limitations imposed by the ramps 38a, 38b and the recesses 26a, 26b. Anterior movement of the meniscal component 20 with respect to the tibial component 30 is limited by the abutment of the upper surface of the anterior ramp 38a with the tapered wall of the anterior recess 26a. Similarly, posterior movement of the meniscal component 20 with respect to the tibial component 30 is limited by abutment of the upper surface of the posterior ramp 38b with the tapered wall of the posterior recess 26b. Lateral and medial movement of the meniscal component 20 with respect to the tibial component 30 is limited by the abutment of the side walls of the ramps 38a and 38b with the side walls of the recesses 26a, 26b. Limited rotational movement of the meniscal component 20 is allowed by virtue of the fact that the recesses 26a, 26b are wedge-shaped in plan view and, again, abutment of the side walls of the ramps 38a, 38b with the appropriate side walls of the recesses 26a, 26b limits this rotation.

The fact that the meniscal component 20 can move anteriorly, posteriorly, laterally and medially, and can also rotate, all with respect to the tibial component 30, means that the meniscal component 20 can, within certain limits, select its own preferred position with respect to the tibial component 30. As mentioned above, this means that the assembly shown in Figure 4 can

tolerate small amounts of misalignment between the femoral and tibial components created during the operative procedure.

An alternative embodiment of the invention is illustrated in Figure 5. The embodiment illustrated in Figure 5 is similar to the embodiment illustrated in Figure 4. However, in the embodiment shown in Figure 5, each recess 26e, 26f and ramp 38e, 38f ends in a small vertical step. This ensures that the risk of the meniscal component 20 riding up onto the ramps 38e, 38f of the tibial component 30 is reduced.

The invention is not limited to either of the embodiments described above but will incorporate modifications and variations which will be apparent to a reader skilled in the art.

CLAIMS

1. A unicompartmental knee prosthesis comprising a femoral component, a meniscal component and a tibial component, interengaging means being provided between the meniscal and tibial components such that limited anterior-posterior, medial-lateral and rotational movement of the meniscal component with respect to the tibial component is allowed, wherein the interengaging means comprise anterior and posterior inclined tongues and anterior and posterior inclined recesses.
2. A unicompartmental knee prosthesis as claimed in claim 1, wherein the inclined recesses are substantially wedge-shaped in plan view.
3. A unicompartmental knee prosthesis as claimed in claim 1 or 2, wherein the anterior and posterior tongues are elongate in plan view.
4. A unicompartmental knee prosthesis as claimed in any one of claims 1 to 3, wherein the tongues are located on the tibial component and recesses are located in the meniscal component.
5. A unicompartmental knee prosthesis as claimed in claim 4, wherein the tongues are located along a

substantially central axis of the tibial component and the recesses are located along a substantially central axis of the meniscal component.

6. A unicompartmental knee prosthesis as claimed in any one of the preceding claims, wherein each tongue and recess has a substantially vertical step at the end thereof facing the other respective tongue or recess.

7. A unicompartmental knee prosthesis as claimed in any one of the preceding claims, wherein the tibial and femoral components are made from a cobalt-chrome alloy.

8. A unicompartmental knee prosthesis as claimed in any one of the preceding claims, wherein the meniscal component is made from ultra-high molecular weight polyethylene.

9. A unicompartmental knee prosthesis substantially as hereinbefore described with reference to either of the embodiments shown in the accompanying drawings.

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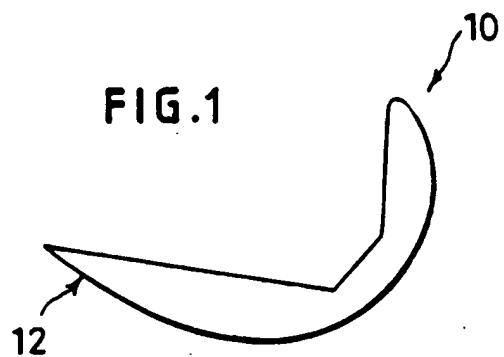


FIG. 1

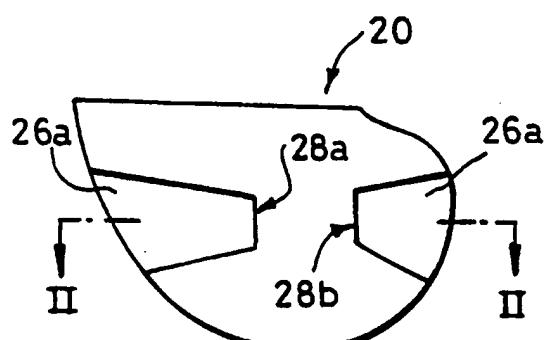


FIG. 2a

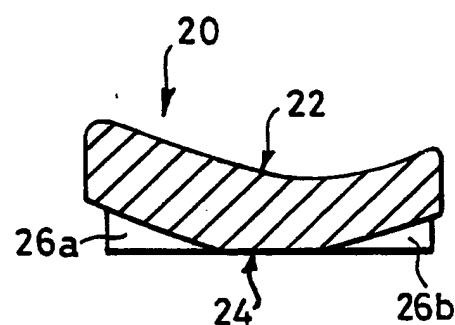


FIG. 2b

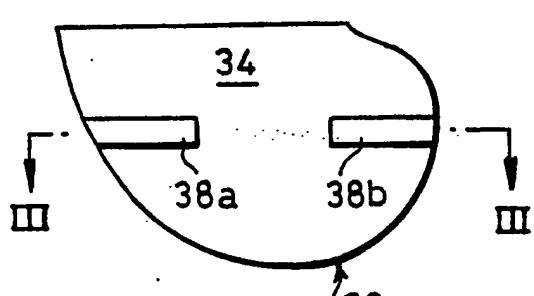


FIG. 3a

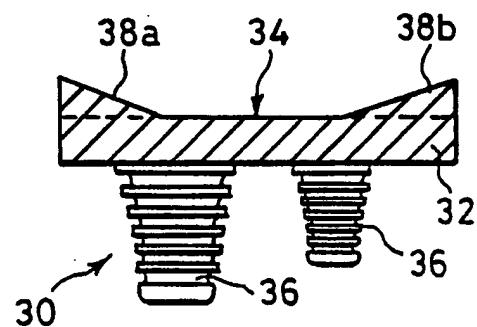


FIG. 3b

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FIG. 4

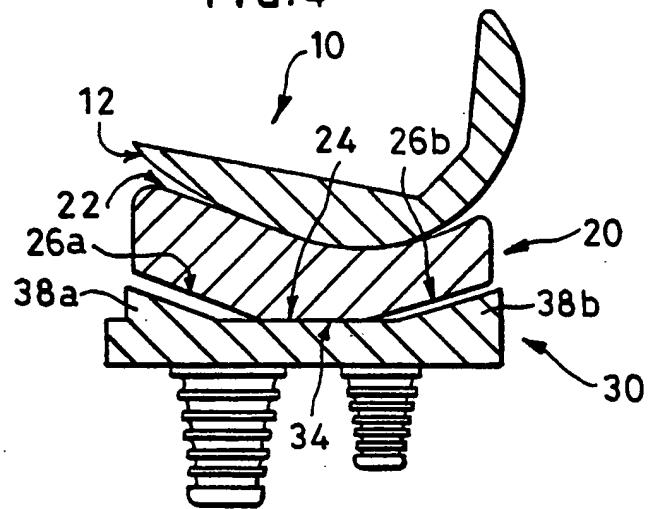
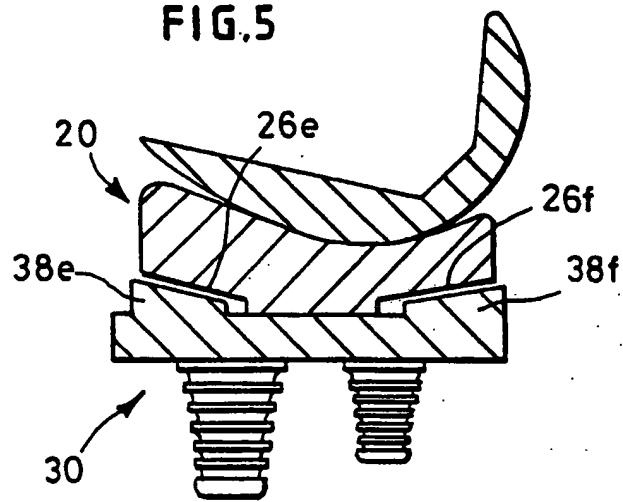


FIG. 5



## INTERNATIONAL SEARCH REPORT

International application No
PCT/GB 95/00821

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61F2/38

According to International Patent Classification (IPC) or to both national classification and IPC
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B. FIELDS SEARCHED
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Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61F

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C. DOCUMENTS CONSIDERED TO BE RELEVANT
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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP,A,0 183 670 (ALBREKTSSON) 4 June 1986 see abstract; figures -----	1,6,7
A	EP,A,0 349 173 (POLYZOIDES ET AL.) 3 January 1990 see column 4, line 35 - column 5, line 27; figures 5-7,10 -----	1,6,7

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International Application No

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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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